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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/736,122	12/15/2003	Ali S. Khayrallah	4015-5158	3589

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EXAMINER	
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ART UNIT	**PAPER NUMBER**
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/736,122	KHAYRALLAH ET AL.	
	Examiner	Art Unit	
	Vineeta S. Panwalkar	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 July 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-125* is/are pending in the application.

4a) Of the above claim(s) *28-38 and 81-87* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,10-27,39-45,51-62,68-80,88-96 and 103-124* is/are rejected.

7)☒ Claim(s) *5-9,46-50,63-67,97-102 and 125* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/15/03,6/13/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 28-38 and 81-87 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 7/16/07.

Claim Objections

2. Claims 39 and 49 are objected to because of the following informalities:

2a. In claim 39, in line 9 of the claim, "the candidate delays" lacks antecedent basis. It is suggested that "adding the candidate delays" be replaced by --- adding candidate delays---.

2b. In claim 49, in line 1 of the claim, "wherein" has been repeated, hence it is suggested that " claim 46 wherein wherein repetitively" be replaced by --- claim 46 wherein repetitively---.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application

by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claim 1-3, 10-16, 19-27, 39, 40, 43, 45, 51-59, 68-78, 88-90, 92, 93, 103, 107-116 and 119-121 are rejected under 35 U.S.C. 102(e) as being anticipated by Heinila (US 6757345 B1), hereinafter, Heinila.

3a. Regarding claims 1, 58, 119 and 120, Heinila shows a receiver (claimed circuit of claim 119) and reception method with a search method for identifying one or more candidate delays for a receiver comprising:

- receiving a signal having one or more signal images, each signal image having a corresponding signal delay (Fig.1, column 1, lines 13-33 and column 4, lines 57-65, wherein receiving reflections are interpreted as claimed images);
- generating a hierarchical delay tree for the received signal comprising a plurality of delay nodes in a lowermost level of the delay tree linked by

branches and one or more linking nodes to a root node at the highest level of the delay tree, wherein each delay node is associated with one of the signal delays (Figs. 4, 5 and 6; column 7, lines 45-62; column 8, lines 10-25; wherein trellis diagram is interpreted as claimed delay tree. In Fig. 6 state E of is claimed root node at claimed highest level and states A-D are interpreted as claimed plurality of delay nodes in claimed lowermost level);

- searching through the delay tree to identify one or more surviving delay nodes; and selecting one or more surviving delay nodes as the candidate delays (Figs. 4, 5 and 6; column 7, lines 45-62 and column 8, lines 37-67, wherein establishing of optimal routes is interpreted as claimed identifying of one or more surviving delay nodes and allocating points along optimal path is interpreted as claimed selecting as candidate delays).

3b. Regarding claims 2, 59 and 121, Heinila shows search method of wherein:

- searching through the delay tree comprises: traversing downward through the delay tree; and at each level of the delay tree below the root node, identifying one or more surviving nodes (Figs. 4, 5 and 6; column 7, lines 45-62 and column 8, lines 37-67, wherein the search conducted layer by layer is interpreted as claimed downward traversing).

3c. Regarding claims 3, Heinila also shows the search method further comprising:

- identifying non-surviving nodes at each level of the delay tree below the root node; and deleting subtrees depending from the non-surviving nodes such that the subsequent searches through the lower levels of the delay tree do not include the deleted subtrees (Column 8, lines 48-68. Since only the selection of optimal route in each layer is stored in the memory, it is interpreted as being equivalent to claimed identifying non-surviving nodes and claimed deleting of subtree).

3d. Regarding claims10-15 and 68-72, all processors have a state machine and a trellis diagram is a state machine because it tells you how to move from state to state. Every trellis will have an entry and exit state, all transitional states are claimed ordered states and while computing values and weights, the processor must be in a waiting state interpreted as claimed steady state. The state machine inherently has states corresponding to every stage of the trellis and to every step taken to find the optimal routes.

3e. Regarding claims16 and 73 Heinila shows search method wherein generating a hierarchical delay tree comprises:

- determining a signal characteristic for one or more signal delays (Column 3, lines 29-40, wherein determining of power density of the signal is interpreted as claimed determining);

- assigning a value based on the signal characteristics to the delay nodes assigning a value to each linking node equal to the sum of the nodes in the next lower level connected by branches to the linking node; and assigning a value to the root node equal to the sum of the linking nodes at the level below the root node connected by branches to the root node (Column 7, line 45 – column 8, line 68; wherein the weight value is interpreted as claimed value based on signal characteristic assigned to the delay nodes and the sum of weight values of transitions are interpreted as claimed assigning a value to each linking node equal to the sum of the nodes in the next lower level connected by branches to the linking node. See Fig. 6 and column 8, lines 44-48. Since allocation points are allocated backwards from layer L-1, the value assigned to root node E is equal to the sum of the linking nodes at the level below the root node connected by branches to the root node).

3f. Regarding claim 19, Heinila shows search method wherein generating a hierarchical delay tree comprises generating a binary delay tree (Trellis diagrams of figs. 4, 5, 6 are interpreted as claimed binary delay trees because from each trellis point there are only two possible paths to move to the next level of the trellis).

3g. Regarding claim 20, Heinila shows search method wherein generating a hierarchical delay tree comprises generating a balanced binary delay tree (Trellis

diagrams of figs. 4, 5, 6 are interpreted as claimed balanced binary delay trees because from each trellis point there are only two possible paths to move to the next level of the trellis and for each stage after the first, there are an even number of nodes per level rendering the tree balanced).

3h. Regarding claim 21, Heinila further shows the search method wherein receiving a signal having one or more signal images comprises receiving a first signal transmitted from a first antenna, said first signal having one or more signal images (Column 4, lines 40-65. Fig. 1 shows how antenna 11 (on the right hand side) transmits first signal with multipath (claimed multiple images)).

3i. Regarding claims 22 and 76, Heinila shows the search method further comprising:

- receiving a second signal transmitted from a second antenna, said second signal having one or more signal images (Column 4, lines 40-65. Fig. 1 shows how antenna 11 (on the left hand side) transmits second signal with multipath (claimed multiple images));
- generating a second hierarchical delay tree for the second signal (Figs. 1 and 2; Column 5, lines 17-25 and column 7, lines 28-61. In Fig. 1, the signals received from device 16 are supplied to one or more RAKE receivers 15 and each RAKE receiver generates the trellis (claimed tree). Thus, in the case

where there are two receivers, the second receiver will generate claimed second tree);

- searching through both delay trees to identify a set of surviving delay nodes associated with the first and second signals; and selecting one or more surviving delay nodes from the set of surviving delay nodes as the candidate delays associated with the first and second signals (Column 8, lines 37-68).

3j. Regarding claims 23 and 74, Heinila shows the search method wherein receiving a signal having one or more signal images comprises receiving the signal at first and second receive antennas (Column 4, line 40 – column 5, line 2. Fig. 1, antennas 17 in receiver 200 are interpreted as claimed first and second receive antennas).

3k. Regarding claims 24 and 78, Heinila shows the search method further comprising combining signal characteristics measured at the first and second receive antennas into a composite characteristic, wherein generating a hierarchical delay tree comprises generating a hierarchical delay tree for the composite characteristic (Column 3, lines 28- 42 and column 7, lines 27-62, wherein power density is interpreted as claimed composite characteristic and trellis is interpreted as claimed delay tree; Figs. 1 and 2; Column 5, lines 17-25. In Fig. 1, the signals received from device 16 are supplied to one or more RAKE receivers 15 and each RAKE receiver generates the trellis (claimed tree). Thus,

in the power density measured for the case where there is only one RAKE receiver will be the composite power density and is hence interpreted as claimed composite characteristic). For claim 78, also refer to rejection of claims 10-15 above.

3l. Regarding claim 25 and 77, Heinila shows the search method wherein generating the hierarchical delay tree comprises generating a first hierarchical delay tree for the signal delays associated with the first receive antenna and generating a second hierarchical delay tree for the signal delays associated with the second receive antenna (Figs. 1 and 2; Column 5, lines 17-25 and column 7, lines 28-61. In Fig. 1, the signals received from device 16 are supplied to one or more RAKE receivers 15 and each RAKE receiver generates the trellis (claimed tree). Thus, in the case where there are two receivers, the first receiver will generate claimed first tree and second receiver will generate claimed second tree). As for claim 77, the first and second delay trees generated will have corresponding first and second state machines (refer to rejection of claims 10-15 above).

3m. Regarding claim 26, Heinila shows the search method wherein searching through the delay tree comprises searching through the first delay tree to identify one or more surviving delay nodes associated with the first receive antenna and

searching through the second delay tree to identify one or more surviving delay nodes associated with the second receive antenna (Column 8, lines 37-68).

3n. Regarding claim 27, Heinila show the search method wherein the receiver is a RAKE receiver (Fig. 1, Column 5, lines 17-25).

3o. As for claim 39, refer to rejections of claims 1 and 27 above. Heinila further shows:

- adding the candidate delays corresponding to the surviving delay nodes to a candidate pool; and selecting one or more finger delays for the RAKE receiver from the candidate pool. (Column 8, line 48 – column 9, line 16, wherein add compare select logic performs claimed adding).

3p. As for claim 40, refer to rejection of claim 16 above.

3q. As for claim 43, refer to rejection of claim 2 above.

3r. As for claim 45, refer to rejection of claim 3 above.

3s. As for claims 51-57 and 75 refer to rejection of claims 10-15 above.

3t. As for claim 88, refer to rejections of claims 1 and 27 above, wherein device 16 of Fig. 1 is interpreted as claimed front end.

3u. As for claim 89, refer to rejection of claim 1 above.

3v. As for claims 90 and 92, refer to rejection of claim 16 above.

3w. As for claim 93, refer to rejection of claim 2 above.

3x. As for claims 103-107 refer to rejection of claims 10-15 above.

3y. As for claim 108, refer to rejection of claim 21 above.

3z. As for claims 109 -111, refer to rejection of claim 22 above.

3aa. As for claim 112, 113 and 116 refer to rejection of claims 24/78 above.

3ab. As for claims 114 and 115 refer to rejection of claims 25/77 above.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 4, 18, 42, 44, 60-62, 79, 80, 94-96, 117, 118 and 122-124 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heinila.

4a. Regarding claims 4, 44, 60, 61, 94, 95, 122 and 123, Heinila also the search method wherein identifying one or more surviving nodes comprises:

- determining a level threshold for each level of the delay tree below the root node; comparing the nodes at one or more levels to the corresponding level threshold; and identifying the nodes that meet or exceed the level threshold as the surviving nodes (Column 8, lines 48-68. Although Heinila does not explicitly disclose claimed threshold, Heinila shows identifying nodes with the highest weight as the survival node. However, it would have been obvious to a person of ordinary skill in the art to use a threshold instead of the highest weight as a deciding factor, so as to simplify calculation (calculating one threshold instead of multiple weights)).

4b. Regarding claims 18 and 42, Heinila shows all the limitations claimed, but fails to explicitly disclose whether the signal characteristic may be signal to noise ratio. However, it would have been obvious to a person of ordinary skill in the art to find signal to noise ratio as a signal characteristic based on which the node values are assigned because signal to noise ratio is a known characteristic in the art for providing indication as to the quality of the received signal and using it as

claimed characteristic would would ensure that the survival path identified would have the highest signal to noise ratio (SNR) and thus the best signal quality.[1]

4c. Regarding claims 79, 80, 117 and 118, it is well known in the art for combiners to comprise OR and AND gates. Thus, it would have been obvious to a person of ordinary skill in the art to use OR and AND gates as combiners because this simplifies the design.[2]

4d. Regarding claim 62, refer to rejection of claims 3 and 61 above.

4e. As for claim 96, refer to rejection of claims 3, 94 and 95 above.

4e. As for claim 124, refer to rejection of claims 3, 122 and 123 above.

5. Claims 17, 41 and 91 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heinila in view of Forney, Jr. et al. (US 5150381), hereinafter, Forney.

5a. Regarding claims 17, 41 and 91, Heinila shows all the limitations claimed, but fails to explicitly disclose whether the signal characteristic may be signal energy.

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[1] References showing SNR as being indicative of received signal quality:
- Chennakeshu et al. (US 5905742)
- Subramanian et al. (US 2002/0015401 A1)
- Chaney et al. (US 5642153)

[2] References showing OR and AND gate combiners in receivers:
- Mandal (US 66944444 B1)
- Delange (US 3691387)
- Cannon (US 41222990)

However, in the same field of endeavor, Forney shows decoding using trellis wherein the energy of a signal point is used as the weight (Column 4, lines 24-34).

Thus, it would have been obvious to a person of ordinary skill in the art to use energy as claimed signal characteristic as suggested by Forney in the trellis decoding suggested by Heinila because it allows for independently assigning the weight for each point. (Column 36, lines 46-65).

Allowable Subject Matter

6. Claims 5-9, 46-50, 63-67, 97-102 and 125 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter:

6a. Regarding claims 5, 46, 63, 97 and 125, prior art of record fails to show the method wherein searching through the delay tree to identify one or more surviving delay nodes further comprises repetitively searching through the delay tree until a desired number of candidates delays are identified, in combination with each and every other limitation of the base claims.

6b. Claims 6-9, 47-50, 64-67 and 98-102 will be allowable as being dependent on claims 5, 46, 63 and 97.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- Omura et al. (US 4967389) shows the use of state machine in a processor.
- Ohlson (US 6339624 B1), Fettweis et al. (US 5430744), Behrens et al. (US 5291499) and Strolle et al. (US 5757855) show the use of state machine as a trellis diagram in a Viterbi decoder.
- Ungerboeck, "Channel Coding wth Multilevel/Phase Signals", IEEE Transcations on Information Theory, Vol. IT-28, No. 1, January 1982 shows trellis modulation with balanced binary tree.

Contact Information

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vineeta S. Panwalkar whose telephone number is 571-272-8561. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

VP

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